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"Applied History of Science and Technology"
History of Science in the Space Program

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At first glance, the subject "Applied History of Science and Technology" should be fairly straightforward. Experience and reflection have taught me, however, that working and learning in the arena of "applied history" is not so straightforward after all. A few years ago, I spoke on a similar theme before a roomful of historians at the annual meeting of the Organization of American Historians. I have long since forgotten what I said; but I will never forget the frustration of one earnest young historian who complained bitterly that policy makers and managers don't read historians' books. In that moment, for me at least, the isolated world of the contemporary academic and the chaotic world of those who make decisions and carry them out were cast in sharp relief. Because those whom we customarily call "applied" historians lack the ideological and institutional protection of the university, they are exceptionally challenged to affirm the value of their calling.

There are historians of science and technology directing and writing the scripts for some ambitious and fascinating museum exhibitions. I think, for example, of David Allison's exhibition on the Information Age at the Smithsonian's Museum of American History, or of Paul Ceruzzu's exhibit on the Evolution of the Computer at the National Air and Space Museum. As David and Paul have learned, once the historian ventures forth from the campus, he or she must acquire the social, organizational, and fund-raising skills that every professional needs to accomplish anything in this day and age. Merely being bright, or a good scholar, or a good writer, is not enough.

Or there are Robert Smith and Joe Tatarewicz, largely responsible for the success of the Space Telescope History Project which, like the Telescope itself, was substantially funded by NASA. Joe developed an impressive Space Telescope documents collection and retrieval system, while Robert was the principal author of The Space Telescope: A Study of NASA, Science, Technology, and Politics,[1] winner of the History of Science Society's 1990 Watson Davis Prize. As readers savor the scholarship, intelligence, and elegant prose of Smith's fine book, the value of the Space Telescope History Project has been proven to those investigating the problems with the Telescope's mirror, discovered to be faulty not long after it was launched in April of this year.

This combination--collecting documents and writing histories of particular science or engineering projects--is now a well-established model of applied history, introduced at NASA for the Apollo lunar landing project of the 1960's. NASA continued with the Space Shuttle History Project, which produced at Johnson Space Center a massive collection of documents and an annotated chronology;[2] we followed the model again with our support of the Space Telescope History Project; and NASA currently supports the Space Station History Project--also a documents collection and monograph-writing effort. The Space Station History Project extends the model

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[1] Robert W. Smith. The Space Telescope: A Study of NASA, Science, Technology, and Politics. New York: Cambridge University Press, 1989.

[2] John F. Guilmartin, Jr. and John Walker Mauer. A Shuttle Chronology: 1964-1973. 5 Vols. (December 1988) NASA-JSC: 23309.

somewhat further by reviving a practice first recorded by the Greek historian Thucydides--and followed routinely by the U.S. military during World War II--of having historians trudge along with the troops, as it were, to record events as they occur. This model of project history is proven of necessity: neither the Peloponnesian War nor modern large-scale science and engineering enterprises have produced the orderly, complete, and coherent "archives" that would enable historians to write about them. More importantly, it has enabled corporate and government managers and executives to reconstruct the past when the ability to do so proved critical in the present--hence the need for concurrent observation, which makes the old debate over scholarly "detachment" somewhat academic.

Notice that I have been speaking of historian and history simultaneously. Doing so, however, confuses the question of "applied history." Historians of science, of all people, should be able to appreciate this distinction. We have become comfortable with the notion that the abstract "science" of the profession's catechism is something quite different from scientists at work--an aggregate of personalities to be comprehended as much by the insights of sociology, psychology, and politics as by the laws of physics.

So when we speak of "applied history of science and technology," we must differentiate between historians and the contents of those books that corporate and government executives don't have time to read. The "history" of our own catechism, the history written and reviewed in our journals, is not the only "history" around, and for most people it is not the history they know. Rather than make the rather self-serving distinction between "scholarly history" and "popular history," let me draw the distinction another way.

Let us, instead, distinguish between "imagined" history--by which I mean anecdotal history, personal memoir, or the history of oral tradition--and "examined" history. I use the term "imagined" rather than "popular," which to most people implies inadequate or untrue. Many discovered truths, especially in the realm of science or art, began as imagined truths--the untested hypothesis, the harmonies of a quartet not yet committed to paper. Examined history is what trained historians do: We sift through the evidence, we make inductions, and sometimes, out of this raw material, we find enough inspiration to write a good story that can be verified. The more blessed among us can bring to that story such gifts of language that it will speak to others besides our peers and acquire the power of "imagined" history.

Without historians, without the books we historians write, imagined history still lives in our memories, private and corporate. Let me give you an example. It is imagined history at NASA that during the Apollo program NASA was populated by an extraordinary collection of some of the most gifted and able young scientists and engineers this country then possessed. Because of their talent and youthful enthusiasm, NASA could do no wrong. Twenty years later, the agency is supposedly populated by a much inferior breed, and can do nothing right.

Two historians--myself and Howard E. McCurdy of American University (trained in political science), whose study of NASA's organizational culture has been supported by NASA's history program--were challenged by this version of the agency's history and examined it in ways that I won't elaborate here, but would be familiar to this audience. We concluded that the many men and handful of women who put the first Man on the Moon did not come to NASA from the tops of their classes at M.I.T., Michigan, and Stanford--as supposed. They were not demographically much different from the scientists or engineers NASA has been hiring for the past 20 years. Most came from the South, many from rural areas; most received their training at State schools. This is not to deny that they were exceptional; rather, the ways in which they were exceptional could not be measured by conventional academic means.

Another part of the imagined history of the space agency is the supposed decline in its ability to "do anything right." This is an easy story to verify, or disprove, as the case turned out to be. Flawed missions, missions where a booster didn't work, or a spacecraft didn't work, or an instrument didn't work, were a higher percentage of total missions in the 1960's and 1970's than they have been in the past decade.

Now the point of all of this is that, in this case, historians took the imagined history seriously; the need to examine it for managerial and policy purposes was compelling; and having examined it, we concluded that there was great explanatory value to the notion of the "life cycle of bureaus" and also of "contextualism" in the history of technology. A real-life concern of institutional management, festering since the Challenger explosion of 1986, provided the occasion for an exercise in "applied history" that has influenced the way NASA sees itself today, and will also have consequences for academic history.[3] Thus, the imagined history that prevails in our institutions, and among ourselves, sometimes survives examination and sometimes does not.

Practicing history in a large organization, for the benefit of that organization, sharpens one's awareness of the soft edges of our discipline and some softness in its center. The distinction and interplay between imagined and examined history is one instance; the distinction between technique and explanation is another. A "good" work of history in the eyes of our peers (if one judges by journal reviews) is one that can be called "thoroughly researched" (that is, the author has sifted through every known piece of documentary information, which is attested to in the book's copious footnotes). A "good" work of history will also be "methodologically sound" (that is, it will hew closely to the techniques and interpretive models currently in favor among the author's and reviewer's colleagues). These attributes, however, count for less among the executives and decision-makers who are the primary audience for corporate and government history. Effective executives and decision-makers want not footnotes, but intelligence. What they need most from the historian is not technique but explanation--historical explanation that is plausible to someone who has had some experience of the world.

Young historians who have spent no fewer than sixteen of the most formative years of their lives in school--elementary school, high school, college, and graduate school--have few opportunities to acquire that "experience of the world" that enabled earlier generations of historians, before the Ph.D. in history was invented, to write plausible history. The executives and decision-makers who do not routinely read most historians' books know from experience what novelists have been telling us for generations: the human personality is wondrous in its intricacy, capable of great surprises. Societies are both stubborn and capable of courageous change. They know, for example, that organizational changes--touted as required for greater efficiency or productivity--are often made to accommodate a personality no one knew how to deal with. They would understand, for example, that you cannot explain Allied strategy in World War II without knowing something about the personalities of General George Patton, General Omar Bradley and Viscount Bernard Montgomery. Their knowledge of these things many scholar-historians have great difficulty attaining, for their work, on the whole, requires little engagement in the complex social interactions that are the stuff of organizational life.

The culture of the academic historian is such that we too easily become the hedgehogs of Sir Isaiah Berlin's great essay on views of history. Recall that Berlin makes figurative use of the Greek poet Archilochus's observation: "The fox knows many things, but the hedgehog knows

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[3] Sylvia Doughty Fries, NASA Engineers in the Apollo Era. NASA SP____ (in Press). Howard E. McCurdy, NASA's Organizational Culture (1990) Unpublished Manuscript.

one big thing." The executive and decision-maker have little use for the knowledge of the hedgehog, which too often resolves itself into some portentous thesis that explains all. Executives and decision-makers need to command the intelligence of the fox--because their world is the world of the fox. One of the finest public executives I know is an avid reader of Shakespeare, who in Berlin's famous characterization shared with Tolstoy the intelligence of the fox. This is what Berlin says of Tolstoy: "When Tolstoy contrasts this real life--the actual, everyday, 'live' experience of individuals--with the panoramic view conjured up by historians, it is clear to him which is real, and which is a coherent, some times elegantly contrived, but always fictitious construction."[4]

The role of the historian in this enterprise we call applied history is not to teach the history of science or technology as his or her academic colleagues write it, nor even to criticize the boss for not reading it. In fact, the productive relationship of the historian to the corporation or public agency is not a teacher/pupil relationship at all. It is, rather, a professional/client relationship, more analogous to lawyer and client. Much of the anguish expressed by historians over the potential for moral and intellectual corruption when historians serve clients resembles the posturing of Hamlet's lady who protested too much. Good historians do not allow themselves to be corrupted by clients any more than do good lawyers.

The professional historian must be able to reconstruct the past for his or her clients as accurately as possible, having correctly understood the client's needs. To do that well, the historian must invest as much intellectual energy in grasping the nature of the client's work as in pursuing his or her own work. Historians with clients must know the full range of pertinent documentary sources. Since, as archivists know all too well, we can only keep about 10 percent of the documents generated in a typical organization, the intelligence that enables the historian to discriminate among documents must be astute and matched to the needs of the organization. It must be the intelligence of the fox.

Secondly, the corporate historian, like the best professional staff, must be able to anticipate questions and answer them promptly and as concisely as possible. Never, never underestimate the intelligence required to synthesize a vast amount of material into the three most important points which can be condensed into a one-page memorandum. As generations of undergraduates can attest, this is an intelligence no less essential to the coherent lecture, but too often missing. Good staff work is also self-effacing. The psychic rewards come not from fame but, to the contrary, from knowing that you can be more effective in the shadows than in the spotlight. Clients do not corrupt; what corrupts is impatience for fame. Impatience for fame, whether in the organization or outside of it--for example, being sought out by the media--not only corrupts, it robs the historian of that low profile he or she requires to gather information and dispense it at the most opportune time.

Treading carefully that delicate boundary between imagined and examined history, the historian can be the steward of an organization's institutional memory, and it is in this role that the historian can be as influential as he or she may be in the classroom.

Ultimately, what the historian can bring to organizations is the one luxury few executives and decision-makers have: the luxury of reflection and perspective--reflection on experiences that range beyond the personal and anecdotal, perspective that recognizes the ebb and flow in events, that enables us to distinguish between the trivial and the significant. How the historian provides

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[4] Isaiah Berlin, The Hedgehog and the Fox: An Essay on Tolstoy's View of History (New York: New American Library, 1957).

that reflection and perspective is most likely a matter of personal style, but I have one caution: Wisdom routinely dispensed is wisdom routinely ignored.

Some significant experience in "applied" history is, in my view, an essential ingredient in the education of the historian, especially historians of modern science and technology. Without personal engagement in the realities that govern the life of scientists, engineers, managers and decision-makers in the large-scale enterprises upon which so much of modern discovery and invention occurs, we are left to reading shadows. The doctoral degree, the "terminal degree" for historians, has unfortunately come to signify the culmination of the historian's education. Given the subject matter of our discipline, it can only be the beginning of a life-long education, one that might include a good bit of Shakespeare--not to mention Tolstoy.

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